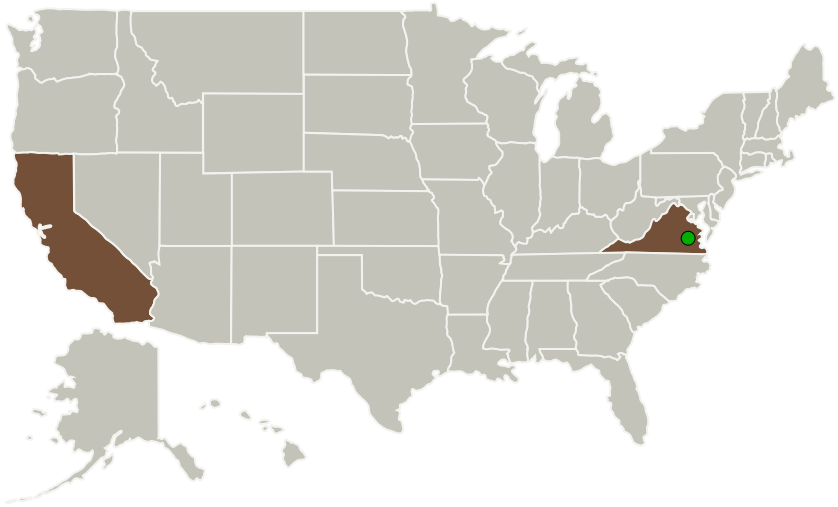
Non-Invasive Environmental Sensing System for Lifecycle Management (NIEL), Phase I

Completed Technology Project (2016 - 2016)

Project Introduction

SDC's Non-Invasive Environmental sensing system for Lifecycle management (NIEL) can be integrated during manufacture of composites making up habitats and space structures to provide up to the minute environmental data on the system over the entire lifecycle of the part from the moment the first ply is laid down to the time when the structure is retired. The NIEL system will include a network of strain, thermal, radiation, and damage sensing fiber optic sensors that are seamlessly embedded at various depths within the composite plies, tows, or weave making up the structure. In this Phase I SBIR, SDC will design, analyze, manufacture, and test a non-invasive fiber optic sensor embedding manufacturing process that provides unparalleled manufacturing and performance data at each ply depth within the part. The process will be non-invasive such that the embedding process is an integral component of the composite material, the fiber optic sensors do not induce failure initiation, and the sensor connector ends are ingressed/egressed from the part through a robust capillary compatible with the resin matrix. SDC will evaluate the embedding processes for survivability and performance and test the integrated parts to demonstrate the capability of the NIEL system for space structure lifecycle management.

Primary U.S. Work Locations and Key Partners



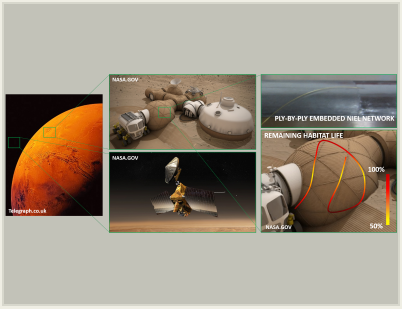


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

Non-Invasive Environmental Sensing System for Lifecycle Management (NIEL), Phase I

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Organizations Performing Work	Role	Type	Location
San Diego Composites, Inc.	Lead Organization	Industry	San Diego, California
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

June 2016: Project Start

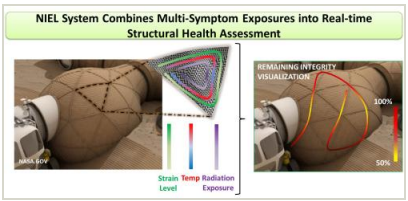
December 2016: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140340)*

Images

Briefing Chart Image
Non-Invasive Environmental Sensing System for Lifecycle Management (NIEL), Phase I *(https://techport.nasa.gov/image/126711)*



Final Summary Chart Image
Non-Invasive Environmental Sensing System for Lifecycle Management (NIEL), Phase I Project Image *(https://techport.nasa.gov/image/135335)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
San Diego Composites, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

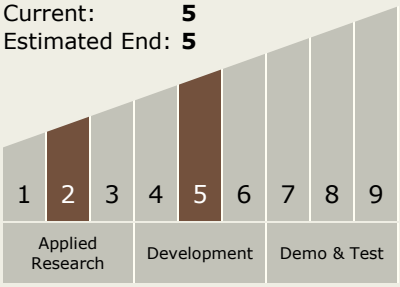
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Quinn Mcallister

Technology Maturity (TRL)

Start: **2**
Current: **5**
Estimated End: **5**



Non-Invasive Environmental Sensing System for Lifecycle Management (NIEL), Phase I

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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.2 Structures
    - TX12.2.3 Reliability and Sustainment

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System